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Chuck Device for Miniature Tool Bits

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3 Cross-Reference

4 The present patent application is a continuation in part of U.S. Patent
5 Application No. 10/104118 filed on 22 March 2002 and entirely
6 incorporated therein.

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8 Field of Invention

9 The present invention relates to a chuck device for engagement with
10 miniature tool bits.

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12 Background of Invention

13 According to U.S. Patent Application No. 10/104118, a chuck device
14 includes a socket 10, at least one ball 14, a first ring 17, an elastic
15 element 24, a sleeve 20, a second ring 25 and a spindle 40. The socket
16 10 defines a chamber 11. The sleeve 20 is mounted on the socket 10.
17 The sleeve 20 is moved relative to the socket 10 from a locking position
18 to a releasing position according to the sleeve 20 presses the ball 14 into
19 the chamber 11 or releases the ball 14 from the chamber 11. The
20 pusher 30 can move in the chamber 11 for receiving a miniature tool bit
21 50. The spindle 40 is securely pressed into the chamber 13 of the
22 socket 10. This chuck device therefore needs a lot of components and
23 assembly of these components is complicated.

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25 The present invention is therefore intended to obviate or at least

1 alleviate the problems encountered in prior art.

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3 **Summary of Invention**

4 The primary objective of the present invention is to provide a chuck
5 device that includes a simple structure.

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7 According to the present invention, a chuck device is provided for a tool
8 bit with an annual groove. The chuck device includes a socket
9 defining a chamber for receiving the tool bit and at least one aperture
10 communicated with the chamber. A spindle extends from the socket.
11 At least one ball is received in the at least one aperture for entering the
12 annular groove of the tool bit. A first ring is mounted on the socket.
13 A first elastic element is mounted on the socket. A sleeve includes a
14 chamber defined therein so as to form an internal face, an annular
15 groove defined in the internal face and an annular rib formed on the
16 internal face. The sleeve is mounted on the socket so that the elastic
17 element is compressed between the ring and the annular rib, thus
18 biasing the sleeve. A second ring is fit in the sleeve for abutting the
19 first ring so as to retain the sleeve on the socket. A second elastic
20 element is put in the chamber of the socket for pushing the tool bit.

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22 Other objects, advantages, and novel features of the invention will
23 become more apparent from the following detailed description when
24 taken in conjunction with the attached drawings.

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1 **Brief Description of Drawings**

2 The present invention will be described through detailed illustration of
3 embodiments referring to the attached drawings.

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5 Figure 1 is a perspective view of a chuck device for tool bits according
6 to a first embodiment of the present invention.

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8 Figure 2 is an exploded view of the chuck device of Figure 1.

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10 Figure 3 is a cross-sectional view of the chuck device of Figure 1.

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12 Figure 4 is similar to Figure 3 except for showing the chuck device
13 engaged with a miniature tool bit.

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15 Figure 5 is similar to Figure 3 except for showing the miniature tool bit
16 disengaged from the chuck device.

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18 Figure 6 is an exploded view of the chuck device for tool bits according
19 to a second embodiment of the present invention.

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21 **Detailed Description of Embodiments**

22 Referring to Figure 1-5, according to a first embodiment of the present
23 invention, a chuck device includes a socket 10, a sleeve 20, an elastic
24 element 24, an elastic element 30, a spindle 14, and a ring 25.

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1 The socket 10 includes a first end and a second end. The first end of
2 the socket 10 axially defines a chamber 11 that includes a plurality of
3 facets and transversely defines two apertures 12 in communication with
4 the chamber 11. Each of the apertures 12 extends through one of the
5 facets of the chamber 11. A ball 13 is received in each of the apertures
6 12. The socket 10 includes an annular groove 15 defined in an
7 external surface thereof. A C-ring 16 is received in the annular groove
8 15. The spindle 14 extends from the second end of the socket 10.
9 The spindle 14 may be connected with a handle (not shown) or a
10 driving element of a pneumatic or electric device (not shown).

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12 The sleeve 20 includes a first end and a second end, an annular groove
13 21 defined in an internal surface of the first end thereof and an annular
14 rib 23 formed on the internal surface of the first end thereof. The
15 annular groove 21 and the annular rib 23 are arranged next to each other.
16 A chamber 22 is defined in the second end of the socket 10 for receiving
17 the first end of the socket 10. An elastic element 24 and the sleeve 20
18 are mounted on the first end of the socket 10. The elastic element 24
19 is compressed between the C-ring 16 and the annular rib 23 of the
20 sleeve 20. Thus, the sleeve 20 is biased by the elastic element 24.

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22 The elastic element 30 includes a first end 31 and a second end 32.
23 The pitch of the first end 31 is greater than that of the second end 32,
24 i.e., the first end 31 is denser than the second end 32. The elastic
25 element 30 is received in the chamber 11 of the socket 10. The first

1 end 31 of the elastic element 30 of the present invention is equivalent of
2 the pusher 30 of U.S. Patent Application No. 10/104118. The second
3 end 31 of the elastic element 30 of the present invention is equivalent of
4 the spring 45 of U.S. Patent Application No. 10/104118. However, the
5 structure of the elastic element 30 of the present invention is much
6 simpler than that is comprised of the pusher 30 and the spring 45.

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8 Referring to figure 3, the sleeve 20 is mounted on the first end of the
9 socket 10. The sleeve 20 is biased by means of the elastic element 24.
10 The balls 13 are pushed into the annular groove 21 by means of the first
11 end 31 of the elastic element 30. The annular rib 23 abuts the balls 13
12 so as to avoid the sleeve 20 escaping the chamber 11 of the socket 10.

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14 Referring to Figure 4, a miniature tool bit 40 includes six facets
15 corresponding to that of the chamber 11 of the socket 10 so that the
16 socket 10 can drive the miniature tool bit 40. The miniature tool bit 40
17 includes an annular groove defined therein. As the miniature tool bit
18 40 is inserted in the chamber 11 of the socket 10, the spring 30
19 (particularly its second end 32) is compressed by means of the
20 miniature tool bit 40. The balls 13 are pushed into the annual groove
21 41 of the miniature tool bit 40 by means of the annual rib 23 so as to
22 prevent the miniature tool bit 40 from escaping the chamber 11 of the
23 socket 10. A ring 25 is fit in the chamber 22 of the sleeve 20. The
24 ring 25 can abut the C-ring 16 in order to retain the sleeve 20 on the
25 socket 10.

1 Figure 5 shows disengagement of the miniature tool bit 40 from the
2 chuck device. The sleeve 20 is moved to the left relative to the socket
3 10 so that the annular groove 21 is aligned with the balls 13. The balls
4 13 enter the annular groove 21, i.e., leave the annular groove 41. Thus,
5 the miniature tool bit 40 is allowed to leave the chuck device. The
6 elastic element 30 pushes the miniature tool bit 40 out of the chamber
7 11.

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9 Figure 6 shows a second embodiment according to the present invention.
10 The second embodiment is identical to the first embodiment except for
11 including a C-ring 19 instead of the balls 13. An annular groove 17 is
12 accordingly defined in the first end of the socket 10 for receiving the
13 C-ring 19. The annular groove 17 is communicated with the chamber
14 11 through apertures 18 each defined in a corner of the chamber 11.
15 The C-ring 19 can enter the annular groove 41 through the apertures 18.

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17 The present invention has been described through detailed illustration of
18 two embodiments. Those skilled in the art can derive variations from
19 the embodiments without departing from the scope of the present
20 invention. Therefore, the embodiments shall not limit the scope of the
21 present invention defined in the claims.

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